

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
24 December 2003 (24.12.2003)

PCT

(10) International Publication Number
WO 2003/106867 A3

(51) International Patent Classification⁷: **F16H 61/12, 59/68**

(21) International Application Number:
PCT/EP2003/006422

(22) International Filing Date: 18 June 2003 (18.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0213937.6 18 June 2002 (18.06.2002) GB

(71) Applicant (for all designated States except US): **EATON CORPORATION** [US/US]; Eaton Center, 1111 Superior Avenue, Cleveland, OH 44114 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **WHEELER, Robert, Stanley** [GB/GB]; 15 The Ferns, Lostock Hall, Preston, Lancashire PR5 5QT (GB). **STASIK, Anthony** [GB/GB]; 28 Natherlay Road, Coppull, Lancashire PR7

5EH (GB). **HAWARDEN, Jeffrey** [GB/GB]; 9 Laburnum Rd., Helmshore, Rossendale, Lancashire BB4 4LF (GB). **CHAN, Kwok, Wah** [GB/GB]; 4 Kielder Hill, Middleton M24 6TF (GB).

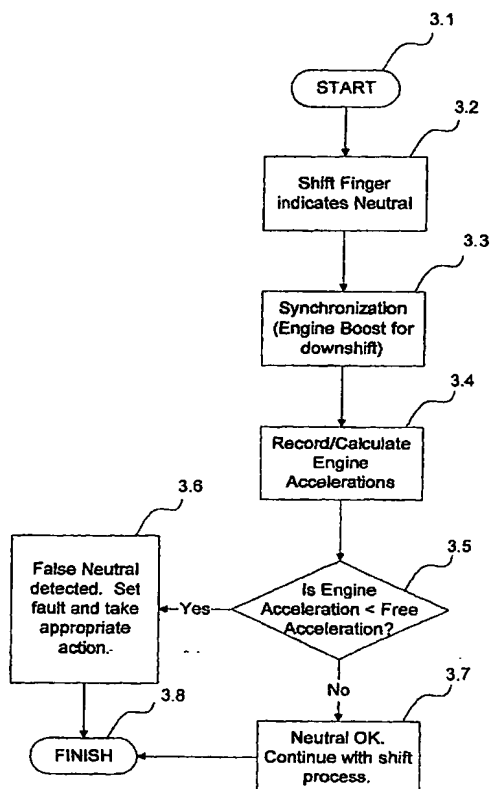
(74) Agent: **RÜGER, BARTHELT & ABEL**; Webergasse 3, 73828 Esslingen (DE).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

[Continued on next page]

(54) Title: METHOD OF DETECTING FALSE NEUTRAL IN AN AUTOMATED TRANSMISSION SYSTEM



(57) Abstract: A method and system for controlling downshifting in an automated mechanical transmission system utilized on a vehicle. When an automatic power downshift from a currently engaged ratio is required, the engine acceleration is monitored and compared with an engine free acceleration to detect a false Neutral condition and to take appropriate action accordingly. Alternatively, a false Neutral condition is detected when the Absolute Value of the rotational speed of the output shaft times the currently engaged gear ratio minus the rotational speed of the input shaft is less than a predetermined value $(ABS((OS*GR)-IS))$.

WO 2003/106867 A3

WO 2003/106867 A3



SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
18 March 2004

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

 Intern. Application No. 10/517830
 PCT/EP 03/06422

 A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 F16H61/12 F16H59/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 242 086 A (EATON CORP) 21 October 1987 (1987-10-21) column 3, line 31 - line 36 column 7, line 49 - column 8, line 27 column 9 - column 11 figures 3A, 3B	9-11
A	---	1-8
X	EP 0 857 897 A (EATON CORP) 12 August 1998 (1998-08-12) abstract figure 7 column 2, line 34 - line 40 column 9, line 49 - column 11, line 15	9-11
A	---	1-8
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

12 December 2003

Date of mailing of the international search report

19/12/2003

Name and mailing address of the ISA

 European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Revilla Soler, X

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/06422

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 725 237 A (HONDA MOTOR CO LTD) 7 August 1996 (1996-08-07) figure 6 column 3, line 7 - line 21 column 7, line 21 - column 8, line 2 ---	2,3,7,8, 10,11
A	EP 0 241 216 A (EATON CORP) 14 October 1987 (1987-10-14) figures 2A,2E column 9, line 9 - line 41 ---	1,4-6,9
A	US 5 315 514 A (DAVIS ALAN R ET AL) 24 May 1994 (1994-05-24) abstract column 3, line 40 - line 43 column 9, line 35 - line 41 ---	1,9
A	US 5 911 787 A (WALKER JAMES M) 15 June 1999 (1999-06-15) column 7, line 24 - line 35 column 8, line 37 - line 48 ---	9
A	US 5 411 450 A (BACHHUBER ANTHONY A ET AL) 2 May 1995 (1995-05-02) column 2, line 12 - line 67 -----	9

INTERNATIONAL SEARCH REPORT

 Intern. Application No
 PCT/EP 03/06422

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0242086	A	21-10-1987	US 4702127 A	27-10-1987
			CA 1297557 C	17-03-1992
			DE 3763167 D1	19-07-1990
			EP 0242086 A2	21-10-1987
			JP 2887475 B2	26-04-1999
			JP 62266257 A	19-11-1987
			KR 9105296 B1	24-07-1991
EP 0857897	A	12-08-1998	US 5875409 A	23-02-1999
			BR 9800421 A	28-09-1999
			CN 1198515 A	11-11-1998
			DE 69813340 D1	22-05-2003
			EP 0857897 A2	12-08-1998
EP 0725237	A	07-08-1996	JP 3104160 B2	30-10-2000
			JP 8210495 A	20-08-1996
			DE 69600218 D1	14-05-1998
			DE 69600218 T2	23-07-1998
			EP 0725237 A1	07-08-1996
			US 5738607 A	14-04-1998
EP 0241216	A	14-10-1987	US 4849899 A	18-07-1989
			BR 8702083 A	09-02-1988
			CA 1281102 C	05-03-1991
			CN 87102608 A , B	18-11-1987
			DE 3770676 D1	18-07-1991
			DE 3788138 D1	16-12-1993
			DE 3788138 T2	16-06-1994
			EP 0241216 A2	14-10-1987
			EP 0385244 A1	05-09-1990
			ES 2046554 T3	01-02-1994
			IN 168894 A1	06-07-1991
			JP 2602020 B2	23-04-1997
			JP 63001845 A	06-01-1988
			KR 9101040 B1	21-02-1991
			MX 167741 B	12-04-1993
			US 5050427 A	24-09-1991
US 5315514	A	24-05-1994	US 5089962 A	18-02-1992
			DE 69207131 D1	08-02-1996
			DE 69207131 T2	14-08-1996
			EP 0533370 A2	24-03-1993
			ES 2082381 T3	16-03-1996
			JP 5196135 A	06-08-1993
			CA 2049239 A1	18-02-1992
			DE 69116627 D1	07-03-1996
			DE 69116627 T2	19-09-1996
			EP 0473298 A2	04-03-1992
			ES 2082928 T3	01-04-1996
US 5911787	A	15-06-1999	JP 4351371 A	07-12-1992
			BR 9901504 A	04-01-2000
			CN 1230647 A	06-10-1999
			DE 69907558 D1	12-06-2003
			EP 0947740 A2	06-10-1999
US 5411450	A	02-05-1995	JP 11325229 A	26-11-1999
			NONE	